

REMARKS

Examiner Mitchell is thanked for the thorough examination and search of the subject Patent Application. Claim 21 has been amended and Claims 50-58 have been canceled.

The making final of the restriction requirement is noted. Non-elected claims 50-58 are hereby canceled. Applicant reserves the right to file a divisional application to the non-elected claims.

All Claims are believed to be in condition for Allowance, and that is so requested.

Reconsideration of the rejection under 35 U.S.C. 102 of Claims 21-24 and 36-39 as being anticipated by Sakurai et al is requested in view of amended Claim 21 and in accordance with the following remarks.

Applicant forms vertical copper pillars 210, as shown in Fig. 4E, and as claimed in amended claim 21. Sakurai et al, in the embodiment shown in Figs. 12A and 12B, teaches “mushroom-shaped” pillars. As described in paragraphs 0161 and 0162, the metal layer 90 “overflows from the through hole” and “extends in all directions over the through hole 22.” While a reflowable material covers portions of the sides of Sakurai’s pillars, these pillars are not the vertical pillars of Applicant’s invention. Sakurai teaches vertical pillars in other embodiments, but Sakurai does not teach vertical pillars in this embodiment where the reflowable material covers a portion of the side surfaces of the pillars. Sakurai teaches in

paragraph 0160 that “the shape of the first metal layer 90 differs from the above embodiments.” Thus, one skilled in the art would assume that the shape of Sakurai’s mushroom-shaped pillars is necessary for this embodiment. Sakurai does not teach the vertical copper pillars of Applicant’s invention where the reflowable material covers a portion of the sidewalls of the vertical pillars.

Reconsideration of the rejection under 35 U.S.C. 102 of Claims 21-24 and 26-29 as being anticipated by Sakurai et al is requested in view of amended Claim 21 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 102 of Claims 21-24 and 26-29 as being anticipated by Jin is requested in view of amended Claim 21 and in accordance with the following remarks.

Jin also does not show a vertical conductor as claimed in Applicant’s amended claim 21. In Fig. 12, Jin shows conductor 28/30/32 having a tapered bottom portion. Claim 21 has been amended to make it clear that insulation layer 410 covers a lower portion of the side surfaces of conductor 210, as shown in Fig. 4E. The reflowable material covers the upper portion of the side surfaces of the conductor 210 not covered by the insulation layer 410. In Jin, the reflowable material 36 covers all of the side surfaces of the conductor 28/30/32 (as shown in Fig. 12). Jin does not teach the insulation layer covering a portion of the side surfaces of the conductor and the reflowable material covering another portion of the side surfaces of the conductor not covered by the insulation layer.

Reconsideration of the rejection under 35 U.S.C. 102 of Claims 21-26, 28, and 29 as being anticipated by Jin is requested in view of amended Claim 21 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 103(a) of Claim 25 as being unpatentable over Sakurai et al in combination with Jin is requested in view of Amended Claim 21 and in accordance with the following remarks.

As discussed above, Sakurai et al does not teach the vertical copper pillars of Applicant's invention where the reflowable material covers a portion of the sidewalls of the vertical pillars. Sakurai et al requires a "mushroom-shaped" pillar in the case where the reflowable material partially covers the sides of the pillar. While it is agreed that Jin teaches nickel and gold layers 30 and 32 under reflowable material 36 (Fig. 12), the combination of Jin with Sakurai et al would not result in Applicant's invention since Sakurai et al requires the "mushroom-shaped" pillar. Applicant's vertical pillar where the side surfaces are partially covered by the reflowable material is not taught or suggested by the combination of references.

Reconsideration of the rejection under 35 U.S.C. 103(a) of Claim 25 as being unpatentable over Sakurai et al in combination with Jin is requested in view of Amended Claim 21 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 103(a) of Claim 27 as being unpatentable over Jin in combination with Sakurai et al is requested in view of Amended Claim 21 and in accordance with the following remarks.

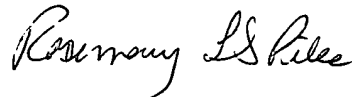
As discussed above, Jin does not teach the insulation layer covering a portion of the side surfaces of the conductor and the reflowable material covering another portion of the side surfaces of the conductor not covered by the insulation layer. The passivation film 14 of Jin and of Sakurai et al is not the same as the insulation layer 410 of Applicant's invention. Applicant's layer 410 is coated onto the substrate surface after formation of the copper pillars, as taught on page 10 of the Specification and as shown in the progression of drawing figures 4B-4D. The passivation film 14 of both Jin and Sakurai is formed overlying the pad. An opening is etched into the passivation layer to expose the pad. The conductor is then formed within the opening in the passivation layer 14. (see Jin paragraphs 0042-0050 and Sakurai et al paragraphs 0095-0101 and 0161). Using the polyimide material of Sakurai et al in Jin does not result in Applicant's invention since this is not the insulation layer used in Applicant's invention to cover a lower portion of the side surfaces of the conductors. The combination of Sakurai et al with Jin does not teach or suggest the insulation layer covering a portion of the side surfaces of the conductor and the reflowable material covering another portion of the side surfaces of the conductor not covered by the insulation layer.

Reconsideration of the rejection under 35 U.S.C. 103(a) of Claim 27 as being unpatentable over Jin in combination with Sakurai et al is requested in view of Amended Claim 21 and in accordance with the remarks above.

Allowance of all Claims is requested.

It is requested that should Examiner Mitchell not find that the Claims are now Allowable that the Examiner call the undersigned at 765 4530866 to overcome any problems preventing allowance.

Respectfully submitted,

A handwritten signature in cursive script that reads "Rosemary L. S. Pike".

Rosemary L. S. Pike. Reg # 39,332